

## **PLASTIC LIMIT TEST**

**1. Objective:** Determination of Plastic Limit is as important as Liquid Limit so as to ascertain Plasticity Index,  $I_p$  of the soil. The plastic limit of a soil is the moisture content, expressed as a percentage of the weight of the oven-dry soil, at the boundary between the plastic and semi-solid states of consistency. It is the moisture content at which a soil will just begin to crumble when rolled into a thread  $\frac{1}{8}$  inch (3 mm) in diameter using a ground glass plate or other acceptable surface.

### **2. Apparatus Required:**



**Porcelain Evaporating dish:** about 12cm in diameter.  
**Glass plate:** 10mm thick and 45cm square or large  
**Brass Rod:** 3 mm in diameter and 10 cm long.  
All the equipments should be cleaned and dried before each test.

**Fig. 1: Glass Plate, Air Tight Containers, Spatula, Brass Rod & Porcelain Evaporating Dish**



Thermostatically controlled with interior of non-corroding material to maintain the temperature around  $105^{\circ}\text{C}$  and  $110^{\circ}\text{C}$

**Fig. 2: Hot Air Oven**



The balance to be used must be sensitive to the extent of 0.01 g

**Fig. 3: Balance**



**Fig. 4: 425 micron IS Sieve**

**3. Reference:** IS 2720(Part 5):1985 Methods of test for soils: Determination of Liquid and Plastic limit (second revision). Reaffirmed- May 2015.

**4. Procedure:**

1. Take about 50 gm of thoroughly mixed portion of the material passing through 425 micron I.S.sieve obtained in accordance with I.S. 2720 (Part 1)- 1983.
2. Mix it thoroughly with distilled water in the evaporating dish till the soil mass becomes plastic enough to be easily molded with fingers.
3. Allow it to season for sufficient time (for 24 hrs) to allow water to permeate throughout the soil mass
4. Take about 8 gm of this plastic soil mass and roll it between fingers and glass plate with just sufficient pressure to roll the mass into a thread of uniform diameter throughout its length. The rate of rolling shall be between 80 and 90 strokes per minute.
5. Continue rolling till you get a thread of 3 mm diameter.
6. Knead the soil together to a uniform mass and re-roll.
7. Continue the process until the thread crumbles when the diameter is 3 mm.
8. Collect the pieces of the crumbled thread in air tight container for moisture content determination as described in IS:2720 (Part 2)-1973.
9. Repeat the test to at least 3 times and take the average of the results calculated to the nearest whole number.

**5. Observation and Recording:** Compare the diameter of thread at intervals with the rod. When the diameter reduces to 3 mm, note the surface of the thread for cracks.

	<b>Container No. 1</b>	<b>Container No. 2</b>	<b>Container No. 3</b>	<b>Container No. 4</b>
Wt. of container + lid, W1				
Wt. of container + lid + wet sample, W2				
Wt. of container + lid + dry sample, W3				
Wt. of dry sample, W3 - W1				
Wt. of water in the soil , W2 - W3				
Water content (%), (W2 - W3) / (W3 - W1) X 100				

**Table 1:** Determination of Plastic Limit

Average Plastic Limit= .....

**6. Calculation:**

1. Flow index,  $I_f = (W_1 - W_2) / \log_{10}(N_2/N_1)$

where,

W1 = Moisture content in percentage corresponding to N1 drops and

W2 = Moisture content in percentage corresponding to N2 drops

2. Plasticity Index,  $I_p = W_L - W_P$  ( $W_L$  = Liquid Limit,  $W_P$  = Plastic Limit)

3. Toughness Index =  $I_p/I_f$